Solution of linear equations – exam questions

Question 1: Jan 2006 – Q6

(a) Show that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ca & ab \end{vmatrix} = (a-b)(b-c)(c-a)$$ *(5 marks)*

(b) (i) Hence, or otherwise, show that the system of equations

$$\begin{aligned} x + y + z &= p \\ 3x + 3y + 5z &= q \\ 15x + 15y + 9z &= r \end{aligned}$$

has no unique solution whatever the values of p, q and r. *(2 marks)*

(ii) Verify that this system is consistent when $24p - 3q - r = 0$. *(2 marks)*

(iii) Find the solution of the system in the case where $p = 1$, $q = 8$ and $r = 0$. *(5 marks)*

Question 2: Jun 2006 – Q5

A set of three planes is given by the system of equations

$$\begin{aligned} x + 3y - z &= 10 \\ 2x + ky + z &= -4 \\ 3x + 5y + (k-2)z &= k+4 \end{aligned}$$

where k is a constant.

(a) Show that $\begin{vmatrix} 1 & 3 & -1 \\ 2 & k & 1 \\ 3 & 5 & k-2 \end{vmatrix} = k^2 - 5k + 6.$ *(2 marks)*

(b) In each of the following cases, determine the **number** of solutions of the given system of equations.

(i) $k = 1$.

(ii) $k = 2$.

(iii) $k = 3$. *(7 marks)*

(c) Give a geometrical interpretation of the significance of each of the three results in part (b) in relation to the three planes. *(3 marks)*

Question 3: Jan 2007 – Q1

Show that the system of equations

$$\begin{aligned} x + 2y - z &= 0 \\ 3x - y + 4z &= 7 \\ 8x + y + 7z &= 30 \end{aligned}$$

is inconsistent. *(4 marks)*

Question 4: Jun 2007 – Q4

Consider the following system of equations, where k is a real constant:

$$\begin{aligned} kx &+ 2y &+ z &= 5 \\ x &+ (k+1)y &- 2z &= 3 \\ 2x &- ky &+ 3z &= -11 \end{aligned}$$

(a) Show that the system does not have a unique solution when $k^2 = 16$. *(3 marks)*

(b) In the case when $k = 4$, show that the system is inconsistent. *(4 marks)*

(c) In the case when $k = -4$:

(i) solve the system of equations; *(5 marks)*

(ii) interpret this result geometrically. *(1 mark)*

Question 5: Jan 2008 – Q5

A system of equations is given by

$$\begin{aligned} x &+ 3y &+ 5z &= -2 \\ 3x &- 4y &+ 2z &= 7 \\ ax &+ 11y &+ 13z &= b \end{aligned}$$

where a and b are constants.

(a) Find the unique solution of the system in the case when $a = 3$ and $b = 2$. *(5 marks)*

(b) (i) Determine the value of a for which the system does not have a unique solution. *(3 marks)*

(ii) For this value of a, find the value of b such that the system of equations is consistent. *(4 marks)*

Question 6: Jun 2008 – Q6

Three planes have equations

$$\begin{aligned} x &+ y &- 3z &= b \\ 2x &+ y &+ 4z &= 3 \\ 5x &+ 2y &+ az &= 4 \end{aligned}$$

where a and b are constants.

(a) Find the coordinates of the single point of intersection of these three planes in the case when $a = 16$ and $b = 6$. *(5 marks)*

(b) (i) Find the value of a for which the three planes do not meet at a single point. *(3 marks)*

(ii) For this value of a, determine the value of b for which the three planes share a common line of intersection. *(5 marks)*

Question 7: Jan 2009 – Q7

Two fixed planes have equations

$$\begin{aligned} x - 2y + z &= -1 \\ -x + y + 3z &= 3 \end{aligned}$$

(a) The point P, whose z-coordinate is λ, lies on the line of intersection of these two planes. Find the x- and y-coordinates of P in terms of λ. *(3 marks)*

(b) The point P also lies on the variable plane with equation $5x + ky + 17z = 1$. Show that

$$(k + 13)(2\lambda - 1) = 0$$ *(3 marks)*

(c) For the system of equations

$$\begin{aligned} x - 2y + z &= -1 \\ -x + y + 3z &= 3 \\ 5x + ky + 17z &= 1 \end{aligned}$$

determine the solution(s), if any, of the system, and their geometrical significance in relation to the three planes, in the cases:

(i) $k = -13$;

(ii) $k \neq -13$. *(6 marks)*

Question 8: Jun 2009 - Q4

(a) Show that the system of equations

$$\begin{aligned} 3x - y + 3z &= 11 \\ 4x + y - 5z &= 17 \\ 5x - 4y + 14z &= 16 \end{aligned}$$

does not have a unique solution and is consistent.

(You are not required to find any solutions to this system of equations.) *(4 marks)*

(b) A transformation T of three-dimensional space maps points (x, y, z) onto image points (x', y', z') such that

$$\begin{bmatrix} x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} x - y + 3z - 2 \\ 2x + 6y - 4z + 12 \\ 4x + 11y + 4z - 30 \end{bmatrix}$$

Find the coordinates of the invariant point of T. *(8 marks)*

Question 9: Jan 2010 – Q4

(a) Determine the two values of k for which the system of equations

$$\begin{aligned} x \quad - 2y + \quad kz &= 5 \\ (k+1)x + 3y \qquad\quad &= k \\ 2x \quad + y + (k-1)z &= 3 \end{aligned}$$

does not have a unique solution. *(4 marks)*

(b) Show that this system of equations is consistent for one of these values of k, but is inconsistent for the other.

(You are not required to find any solutions to this system of equations.) *(8 marks)*

Question 10: Jun 2010 – Q6

The line L and the plane Π have vector equations

$$\mathbf{r} = \begin{bmatrix} 7 \\ 8 \\ 50 \end{bmatrix} + t\begin{bmatrix} 6 \\ 2 \\ -9 \end{bmatrix} \quad \text{and} \quad \mathbf{r} = \begin{bmatrix} -2 \\ 0 \\ -25 \end{bmatrix} + \lambda\begin{bmatrix} 5 \\ 3 \\ 4 \end{bmatrix} + \mu\begin{bmatrix} 1 \\ 6 \\ 2 \end{bmatrix}$$

respectively.

(a) (i) Find direction cosines for L. *(2 marks)*

(ii) Show that L is perpendicular to Π. *(3 marks)*

(b) For the system of equations

$$\begin{aligned} 6p + 5q + r &= 9 \\ 2p + 3q + 6r &= 8 \\ -9p + 4q + 2r &= 75 \end{aligned}$$

form a pair of equations in p and q only, and hence find the unique solution of this system of equations. *(5 marks)*

(c) It is given that L meets Π at the point P.

(i) Demonstrate how the coordinates of P may be obtained from the system of equations in part **(b)**. *(2 marks)*

(ii) Hence determine the coordinates of P. *(2 marks)*

Solution of linear equations – exam questions MS

Question 1: Jan 2006 – Q6

6(a)	$\Delta = \begin{vmatrix} 0 & 0 & 1 \\ a-c & b-c & c \\ b(c-a) & a(c-b) & ab \end{vmatrix}$	M1	
	$= (a-c)(b-c)\begin{vmatrix} 0 & 0 & 1 \\ 1 & 1 & c \\ -b & -a & ab \end{vmatrix}$	A1 A1	
	$= (a-c)(b-c)\,(b-a)$	M1	
	$= (a-b)(b-c)(c-a)$	A1	5
b)(i)	Noting $a = b = 3,\ c = 5$ in coefft. matrix $\Rightarrow\ \Delta = 0$ since factor $(a-b) = 0$	M1	
	Hence no unique soln. to system	A1	2
(ii)	$3R_2 + R_3 = 24R_1$	M1	
	giving consistency iff $24p - 3q - r = 0$	A1	2
(iii)	$x + y + z = 1$ $3x + 3y + 5z = 8$ $5x + 5y + 3z = 0$		
	$(2) - 3\times(1)$ or $(3) - 5\times(1) \Rightarrow z = 2\frac{1}{2}$	M1 A1	
	Then $x + y = -1\frac{1}{2}$	B1	
	Setting $x = \lambda$ (e.g.) $\Rightarrow y = -1\frac{1}{2} - \lambda$	M1	
	All correct, any form	A1	5
	Special Case ruling for those who don't attempt to parametrise but who show this *is* the full solution: **4 + B0**		

Question 2: Jun 2006 – Q5

5(a)	$\begin{vmatrix} 1 & 3 & -1 \\ 2 & k & 1 \\ 3 & 5 & k-2 \end{vmatrix}$	M1	
	$= k^2 - 2k - 10 + 9 + 3k - 5 - 6(k-2)$ $= k^2 - 5k + 6$	A1	2
b)(i)	When $k = 1$, $\Delta \neq 0 \Rightarrow \exists$ **one** soln.	B1	
(ii)	When $k = 2$, $\Delta = 0$ (no unique soln.)		
	System is $x + 3y - z = 10$ $2x + 2y + z = -4$ $3x + 5y \quad = 6$	B1	
	$R_1 + R_2 = R_3$ on *both* sides	M1	
	$\Rightarrow \exists\ \infty$-ly many soln.s	A1	
(iii)	When $k = 3$, $\Delta = 0$ (no unique soln.)		
	System is $x + 3y - z = 10$ $2x + 3y + z = -4$ $3x + 5y + z = 7$	B1	
	$(1) + (2) \Rightarrow 3x + 6y = 6$ $(1) + (3) \Rightarrow 4x + 8y = 17$	M1	
	$\Rightarrow$ System inconsistent and $\exists$ **no** soln.s	A1	7
(c)	$k = 1$: the (single) point of intersection of 3 planes	B1√	
	$k = 2$: 3 planes meet in a line (or form a sheaf)	B1√	
	$k = 3$: 3 planes form a "prism" (or have three parallel lines of intersection; or have no common intersection)	B1√	3
	Total		**12**

Question 3: Jan 2007 – Q1

1	$\left(\begin{array}{ccc\|c} 1 & 2 & -1 & 0 \\ 3 & -1 & 4 & 7 \\ 8 & 1 & 7 & 30 \end{array}\right) \to \left(\begin{array}{ccc\|c} 1 & 2 & -1 & 0 \\ 0 & -1 & 7 & 7 \\ 0 & -15 & 15 & 30 \end{array}\right)$	M1 A1	
	$\to \left(\begin{array}{ccc\|c} 1 & 2 & -1 & 0 \\ 0 & -1 & 1 & 1 \\ 0 & -1 & 1 & 2 \end{array}\right)$	A1 B1F	4
	Or $\Delta = -7 - 3 + 64 - 8 - 4 - 42 = 0$	(M1) (A1)	
	and Δ_x or Δ_y or $\Delta_z = 0$ shown also Explaining this $\Rightarrow$ inconsistency	(A1) (B1)	(4)
	Or Solving **(1)** & **(2)**, say, to get $x = \lambda,\ y = 1 - \lambda,\ z = 2 - \lambda$	(M1) (A1) (A1)	
	Subst^g. in **(3)** $\Rightarrow 15 = 30$	(B1)	(4)
	Total		**4**

Question 4: Jun 2007 – Q4

4(a)	$\Delta = \begin{vmatrix} k & 2 & 1 \\ 1 & k+1 & -2 \\ 2 & -k & 3 \end{vmatrix}$		
	$= 3k^2 + 3k - k - 8 - 2(k+1) - 2k^2 - 6$	M1	
	$= k^2 - 16$	A1	
	When $k^2 = 16$ $\Delta = 0 \Rightarrow$ no unique soln.	E1	3
	Or Subst^g. Both $k = 4$ and $k = -4$ and attempt at det.	(M1)	
	Each case correctly shown	(A1) (A1)	3
(b)	$k = 4 \Rightarrow$ $4x + 2y + z = 5$ $x + 5y - 2z = 3$ $2x - 4y + 3z = -11$	B1	
	Elim^g. z from **(1)** & **(2)** $\Rightarrow 9(x+y) = 13$ **(1)** & **(3)** $\Rightarrow 10(x+y) = 26$ Or **(2)** & **(3)** $\Rightarrow 7(x+y) = -13$	M1 A1	
	Explaining inconsistency,eg from $\frac{13}{9} \neq \frac{26}{10}$	E1	4
	Alternatively (mark as above) Elim^g. x from **(1)** & **(2)** $\Rightarrow 9(2y - z) = 7$ **(2)** & **(3)** $\Rightarrow 7(2y - z) = 17$ **(1)** & **(3)** $\Rightarrow 5(2y - z) = 27$ **Or** Elim^g. y from **(1)** & **(2)** $\Rightarrow 9(2x + z) = 19$ **(2)** & **(3)** $\Rightarrow 7(2x + z) = -43$ **(1)** & **(3)** $\Rightarrow 5(2x + z) = -1$		
(c)(i)	$k = -4 \Rightarrow$ $-4x + 2y + z = 5$ $x - 3y - 2z = 3$ $2x + 4y + 3z = -11$	B1	
	Eliminating one variable	M1	
	$-7x + y = 13$ **Or** $10y + 7z = -17$ **Or** $10x + z = -21$	A1	
	Parametrisation	M1	
	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 13 \\ -21 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 7 \\ -10 \end{pmatrix}$	A1	5
	Correct alternate answer forms: $x\ ,\ y = 13 + 7x\ ,\ z = -21 - 10x$ $y\ ,\ x = (y - 13)/7\ ,\ z = (-21 - 10y)/7$ $z\ ,\ y = (-17 - 7z)/10\ ,\ x = (-21 - z)/10$ Do not accept a mixed parametrisation		
(ii)	The line of intersection of 3 planes	B1	1
			13

Question 5: Jan 2008 – Q5

5(a)	eg $3\times(1)-(2) \Rightarrow 13y+13z=-13$	M1	
	$(3)-(2) \Rightarrow 15y+11z=-5$	A1A1	
		M1	
	$x=6,\ y=1½,\ z=-2½$	A1	5
	Alt I (Cramer's Rule):		
	$\Delta=\begin{vmatrix}1&3&5\\3&-4&2\\3&11&13\end{vmatrix},\ \Delta_x=\begin{vmatrix}-2&3&5\\7&-4&2\\2&11&13\end{vmatrix},$		
	$\Delta_y=\begin{vmatrix}1&-2&5\\3&7&2\\3&2&13\end{vmatrix},\ \Delta_z=\begin{vmatrix}1&3&-2\\3&-4&7\\3&11&2\end{vmatrix}$	(M1)	
	$=52,\ 312,\ 78$ and -130 respectively	(A1 A1)	
	$x=\dfrac{\Delta_x}{\Delta},\ y=\dfrac{\Delta_y}{\Delta},\ z=\dfrac{\Delta_z}{\Delta}$	(M1)	
	$x=6,\ y=1½,\ z=-2½$	(A1)	(5)
	Alt II (Augmented matrix method):		
	$\left[\begin{array}{ccc\|c}1&3&5&-2\\3&-4&2&7\\3&11&13&2\end{array}\right]\to$	(M1)	
	$\left[\begin{array}{ccc\|c}1&3&5&-2\\0&-13&-13&13\\0&2&-2&8\end{array}\right]$	(A1)	
	$\to\left[\begin{array}{ccc\|c}1&3&5&-2\\0&1&1&-1\\0&1&-1&4\end{array}\right]$	(A1)	
	$\to\left[\begin{array}{ccc\|c}1&3&5&-2\\0&1&1&-1\\0&0&-2&5\end{array}\right]$		
	Substituting back to get	(M1	
	$x=6,\ y=1½,\ z=-2½$	A1)	(5)
	Alt iii (inverse matrix method):		
	$C^{-1}=\dfrac{1}{52}\begin{bmatrix}-74&16&26\\-33&-2&13\\45&-2&-13\end{bmatrix}$	(M1) (A1 A1)	
	$\begin{bmatrix}x\\y\\z\end{bmatrix}=C^{-1}\begin{bmatrix}-2\\7\\2\end{bmatrix}=\begin{bmatrix}6\\1.5\\-2.5\end{bmatrix}$	(M1) (A1)	(5)

Question 6: Jun 2008 – Q6

6(a)	eg $(2)-(1) \Rightarrow x+7z=-3$	M1A1	
	$(3)-2\times(2) \Rightarrow x+8z=-2$	A1	
	Solving 2×2 system	M1	
	$x=-10,\ y=19,\ z=1$	A1	5
(b)(i)	$\begin{vmatrix}1&1&-3\\2&1&4\\5&2&a\end{vmatrix}=15-a$	B1	
	Setting = to zero and solving for a	M1	
	$a=15$	A1	3
(ii)	$x+y-3z=b$ $2x+y+4z=3$ $5x+2y+15z=4$		
	eg $(2)-(1) \Rightarrow x+7z=3-b$	M1A1	
	$(3)-2\times(2) \Rightarrow x+7z=-2$	A1	
	Equating the two RHSs	M1	
	$b=5$	A1	5
	Total		**13**
6(a)	**Alternate Schemes** **Cramer's Rule**		
	$\Delta=\begin{vmatrix}1&1&-3\\2&1&4\\5&2&16\end{vmatrix},\ \Delta_x=\begin{vmatrix}6&1&-3\\3&1&4\\4&2&16\end{vmatrix},$		
	$\Delta_y=\begin{vmatrix}1&6&-3\\2&3&4\\5&4&16\end{vmatrix},\ \Delta_z=\begin{vmatrix}1&1&6\\2&1&3\\5&2&4\end{vmatrix}$	M1	
	$=-1,\ 10,\ -19$ and -1 respectively	A1	
	$x=\dfrac{\Delta_x}{\Delta},\ y=\dfrac{\Delta_y}{\Delta},\ z=\dfrac{\Delta_z}{\Delta}$	M1	
	$x=-10,\ y=19,\ z=1$	A1 A1	(5)

Question 7: Jan 2009 – Q7

7(a)	$x-2y=-1-\lambda$		
	$-x+y=3-3\lambda$	B1	
	Solving for x and y in terms of λ	M1	
	$x=7\lambda-5$ and $y=4\lambda-2$	A1	3
(b)	Subst^{g}. x, y, z in terms of λ in $5x+ky+17z=1$	M1	
	$35\lambda-25+k(4y-2)+17\lambda-1=0$		
	Factsn. attempt: $(4y-2)(k+13)=0$	dM1	
	$(2y-1)(k+13)=0$	A1	3
c)(i)	When $k=-13,\ 5x-13y+17z$		
	$=35\lambda-25-52\lambda+26+17\lambda\equiv1$	B1	
	The three planes intersect in a line	B1	
	Solns. $x=7\lambda-5,\ y=4\lambda-2,\ z=\lambda$	B1F	
(ii)	When $k\neq-13,\ \lambda=½$	B1	
	Soln. $(-1½,\ 0,\ ½)$	B1F	
	Three planes meet at a point	B1	6
	Total		**12**

Question 8: Jun 2009 - Q4

4(a)	$3 \times [1] - [2] \Rightarrow 5x - 4y + 14z = 16$	M2 A1	
	Giving no unique soln. *and* consistent	E1	
	For those who just show $\Delta = 0$ to conclude that there is no unique soln.	(M1) (A1)	
	OR		
	Solving e.g. in [1] & [2]: $\frac{x-4}{2} = \frac{y-1}{27} = \frac{z}{7} = \lambda$	(M1) (A1)	
	Subst^g. in [3] for x, y, z in terms of λ Showing LHS = RHS = 16	(M1) (A1)	
	OR		
	$\begin{matrix}3 & -1 & 3\\ 4 & 1 & -5\\ 5 & -4 & 14\end{matrix}\left\vert\begin{matrix}11\\17\\16\end{matrix}\right. \to \begin{matrix}3 & -1 & 3\\ 1 & 2 & -8\\ -1 & -2 & 8\end{matrix}\left\vert\begin{matrix}1\\6\\-6\end{matrix}\right.$	(M1) (A1) (A1)	
	$R_2{}' = -R_3{}' \Rightarrow$ no unique soln. and consistency	(E1)	
	OR		
	Showing $\Delta = 0 \Rightarrow$ no unique soln.	(M1) (A1)	
	Attempt at each of $\Delta_x = \begin{vmatrix}11 & -1 & 3\\ 17 & 1 & -5\\ 16 & -4 & 14\end{vmatrix}$, $\Delta_y = \begin{vmatrix}3 & 11 & 3\\ 4 & 17 & -5\\ 5 & 16 & 14\end{vmatrix}$ and $\Delta_z = \begin{vmatrix}3 & -1 & 11\\ 4 & 1 & 17\\ 5 & -4 & 16\end{vmatrix}$	(M1)	
	Each shown = 0 and this $\Rightarrow$ consistency	(A1)	4
(b)	Setting $x' = x,\ y' = y,\ z' = z$ $2 = -y + 3z$ $-12 = 2x + 5y - 4z$ $30 = 4x + 11y + 3z$	M1 A1	
	E.g. $\left.\begin{matrix}2 = 3z - y\\ 54 = 11z + y\end{matrix}\right\}$ by (3) – 2 × (2)	M1 A1	
	$z = 4,\ y = 10$ $x = -23$	M1 A1 M1 A1	8
	OR Other methods for solving a 3×3 system will be constructed should they arise		
	Total		**12**

Question 9: Jan 2010 – Q4

4(a)	$\begin{vmatrix}1 & -2 & k\\ k+1 & 3 & 0\\ 2 & 1 & k-1\end{vmatrix} = 3k^2 - 2k - 5$	M1 A1	
	$k = \frac{5}{3}, -1$	M1 A1	4
(b)	$k = \frac{5}{3} \Rightarrow \begin{matrix}5 = x - 2y + \frac{5}{3}z\\ \frac{5}{3} = \frac{8}{3}x + 3y\\ 3 = 2x + y + \frac{2}{3}z\end{matrix}$	B1	
	$8x + 9y = 5 \,/\, 15y - 8z = -21 \,/\, 5x + 3z = 11$	M1 A1;A1	
	$k = -1 \Rightarrow \begin{matrix}5 = x - 2y - z\\ -1 = 3y\\ 3 = 2x + y - 2z\end{matrix}$	B1	
	$x - z = \frac{13}{3} \,/\, 2x - 2z = \frac{10}{3} \,/\, 5x - 5z = 11$	M1	
	OR	A1	
	$y = -\frac{1}{3}$ and $y = -\frac{7}{5}$ found	A1	8
	Total		**12**

Question 10: Jun 2010 – Q6

6(a)(i)	$\bullet = \sqrt{6^2 + 2^2 + 9^2}$ attempted *and* $\pm\left(\frac{6}{\bullet}, \frac{2}{\bullet}, \frac{-9}{\bullet}\right)$	M1	
	$\bullet = 11$ and all correct	A1	2
(ii)	Either $\begin{bmatrix}5\\3\\4\end{bmatrix} \times \begin{bmatrix}1\\6\\2\end{bmatrix} = -3\begin{bmatrix}6\\2\\-9\end{bmatrix}$	M1 A1	
	Explaining that d.v. of L is in dirn. of Π's nml. $\Rightarrow L \perp^r \Pi$	B1	
	Or $\begin{bmatrix}6\\2\\-9\end{bmatrix} \bullet \begin{bmatrix}5\\3\\4\end{bmatrix} = 0$ and $\begin{bmatrix}6\\2\\-9\end{bmatrix} \bullet \begin{bmatrix}1\\6\\2\end{bmatrix} = 0$	(M1) (A1)	
	Explaining that d.v. of L is $\perp^r$ to 2 (non-//) vectors in $\Pi \Rightarrow L \perp^r \Pi$	(B1)	3
(b)	E.g. 6×① – ②: $46 = 34p + 27q$	M1	
	2×① – ③: $-57 = 21p + 6q$ ② – 3×③: $-217 = 29p - 9q$	A1 A1	
	2×④ + 9×⑤: $605 = -121p$	M1	
	$p = -5,\ q = 8,\ r = -1$	A1	5
(c)	(i) $\begin{matrix}7 + 6t = -2 + 5\lambda + \mu\\ 8 + 2t = 0 + 3\lambda + 6\mu\\ 50 - 9t = -25 + 4\lambda + 2\mu\end{matrix}$		
	$\to \begin{matrix}9 = -6t + 5\lambda + \mu\\ 8 = -2t + 3\lambda + 6\mu\\ 75 = 9t + 4\lambda + 2\mu\end{matrix}$	M1	
	i.e. the above system with $p = -t,\ q = \lambda$ and $r = \mu$	A1	2
	(ii) Subst^g. $t = 5$ into L's eqn.		
	Or $\lambda = 8$ *and* $\mu = -1$ into Π's eqn.	M1	
	$P = (37, 18, 5)$	A1	2
	Total		**14**